ENTER
MB
1-17-02

CLEAN VERSION OF SUBSTITUTE SPECIFICATION

Field of the Invention

The present invention relates to a tripod bearing assembly particularly for a motor vehicle.

Background of the Invention

Tripod bearing assemblies of the prior art include a spider with three trunnions drivably engaged with an outer member to transmit torque from a first shaft to a second shaft. The tripod bearing assembly permits angular and axial displacement between the two shafts during dynamic rotation of the assembly. Typically, a needle bearing is provided between each trunnion and the outer member.

The needle bearing of the prior art is generally assembled to the] trunnion in one of two manners and particularly designed thereof. A first bearing type and assembly method is illustrated in Figure 1. The trunnion supports a plurality of needles which support a roller which engages a branch of an outer member of a constant velocity joint. In the prior art assembly shown in Figure 1, the needles bear directly on a bearing surface machined onto the trunnion. An outer bearing is provided between the needles and the outer member (the outer member is not shown). The needles are therefore assembled between the trunnion and the outer bearing. Such an assembly requires a large amount of labor or specialized machinery to enable the assembly of the individual needles in this manner. It would therefore be desirable to provide an assembly in which the needles were assembled in a subassembly prior to installation onto the trunnion.

A second type of bearing is illustrated in Figures 2 and 3. This assembly includes a preassembled needle bearing interposed between a trunnion and outer member. The needles are assembled into a bearing assembly prior to installation of the bearing assembly onto a trunnion.

The prior art assembly shown in Figure 2 and 3 includes a means for displacing the bearing assembly relative to the trunnion. As illustrated in Figure 2, the displacement comprises an angular movement of the trunnion relative to the inner race of the bearing assembly.

Figure 3 illustrates an alternate means for displacing the bearing assembly relative to the trunnion comprising an axial movement of the trunnion relative to the inner race of the bearing provided between the trunnion and the needle bearing and also require additional machining of the trunnion to permit the axial sliding movement. It would be desirable to provide a trunnion assembly which includes needle bearings which are preassembled into a bearing assembly which is subsequently assembled onto the trunnion, but which does not require relative axial or rotational movement to the trunnion, so machining of the trunnion is minimized.

Summary of the Invention

In accordance with the objects of this invention, an improved tripod assembly is provided. The tripod bearing assembly includes a spider assembly with a trunnion. A bearing assembly is press fit onto the trunnion. The bearing assembly has an inner race, an outer race and a plurality of needle rollers to permit relative rotation between the inner and outer races. The bearing assembly is axially retained to the spider. The trunnion therefore does not require machining and the bearing is preassembled prior to installation onto the trunnion.

Brief Description of Drawings

3

Figure 1 is an exploded view of a prior art trunnion of a tripod bearing assembly.

Figure 2 is a partial side sectional view of an alternative prior art tripod bearing assembly.

Figure 3 is a partial end sectional view of the prior art tripod shown in Figure 2.

Figure 4 is a partial sectional view of a needle roller assembly being installed on a trunnion according to the present invention.

Figure 5 is a partial sectional view of a needle roller assembly being installed on a trunnion according to an alternative embodiment of the present invention.

Detailed Description of Preferred Embodiment

Figure 4 illustrated a tripod bearing assembly 10. The assembly 10 includes a spider 12 having three trunnions 20 equally spaced. A bearing 40 is pressed fit onto the trunnion 20. The bearing 40 includes an inner race 42 supporting a plurality of needles 46, and an outer race 48 supported by the needles 46. In a preferred embodiment, the inner race comprises a formed cup, preferably formed by drawing the inner race to the necessary shape. The outer race 48 is rotatable relative to the inner race 42 on the needle 46. The outer race 48 drivably engages an outer member (not shown) in a manner known to one skilled in the art.

The trunnion 20 includes an outer diameter 30 which is sized to be press fit to the inner surface 44 of the inner bearing 40. The press fit of the bearing 40 to the trunnion 20 and the inner race 42 eliminate the need for machining (such as turning or grinding) of the outer diameter 30 of the trunnion 20, since it is not a bearing surface. Thus, the trunnion may be assembled "as formed" without finish machining in this embodiment. The spider 12 could, for example, be forged, then have the bearing assemblies 40 press fit onto the trunnions 20, then finally assembled into a constant velocity joint assembly for use in an automobile.

4

An undercut 52 is preferably formed on the trunnion to further eliminate the need for any finish machining of the spider at this surface. The bearing 40 is axially restrained in a first direction by a shoulder 54 provided on the spider adjacent undercut 52. A snap ring groove 50 is provided at the distal end of the trunnion 20 to engage a snap ring (not shown) to axially retain the bearing 40 to the spider 12 in the opposite direction. Thus, during operation of the joint 10, the bearing 40 is axially fixed to the [trunion] trunnion 20 between the snap ring groove 50 an the shoulder 54 without the need for finish machining. The press fit also aids in axially retaining the bearing 40 to the trunnion 20.

The outer race 48 rotates circumferentially about the trunnion 20. The outer member (not shown) is able to rotate or move axially relative to the outer race 48 in a manner known to one skilled in the art, similar to the manner described in U.S. patent 4,693,698, which is incorporated herein by reference. The tripod thus accommodates any angular deflection of the joint or relative axial movement.

The non-bearing surface 30 of the trunnion 20 comprises a cylinder. The engagement of the cylindrical trunnion with the inner surface 44 of the bearing 40 prevents angular displacement there between.

In an alternative embodiment, as shown in Figure 5, a bearing assembly 60 is fit onto a spider 14. The spider includes three trunnions 72 as described above with reference to Figure 4. Each trunnion 72 includes a finished bearing surface 74. The needles of the bearing 60 rotate at 62 on the bearing surface 74 as an inner race in a manner similar to that described in the '698 patent. The bearing 60 includes a plurality of needles 64, an outer race 66, and a cage 68 to retain the needles 64 after assembly to the outer race 66, prior to installation onto the trunnion 72. Thus, the bearing assembly 60 is shipped as a modular unit and pressed fit onto the trunnion 14

5

in a simple manner, without the need to handle loose needles at the tripod assembly source. The cage is preferably made from a glass-filled polymer as is known to one skilled in the art. The cage includes a plurality of pockets for retaining the needles to the outer race as is known to one skilled in the art. In an alternative embodiment, the cage is formed from steel.

In a manner similar to that described above with reference to Figure 4, the bearing 60 is retained after assembly in a first axial direction by a shoulder 80 provided on the spider 14 adjacent trunnion 72. An undercut 78 is provided on the trunnion 72 to simplify finish machining. A groove 76 is provided at the opposite end of the trunnion 72. A snap ring 77 is installed in the groove 76 after the bearing 60 is assembled to retain the bearing 60 in the second axial direction. In this embodiment, the trunnion preferably includes a ground surface 74, since it is a bearing surface. The cage 68 serves as an assembly aid to prevent the need for assembling the needles at final assembly of the joint, as the bearing 60 is shipped as an assembly.

The above spider assembly has been describe with reference to a constant velocity joint. However, one skilled in the art recognizes that these concepts ma be used in a universal joint.

It is to be understood that the embodiments of the invention describes above are merely illustrative of application of principals of the present invention. Numerous modification may be made to the methods and apparatus described above without departing from the true spirit and scope of the invention.